

Martensitic Stainless Steel

EN 1.4021- QT 700

A hardenable stainless steel

Typical analysis %	C 0,20	Cr 13,0	
Norms	Steel grade		
EN 10088-3 QT 700	1.4021		
ASTM A276	(Type 420)		
Delivery condition	Quenched and tempered		

Physical properties acc. to EN 10088

Temperature	20° C	100° C	200° C	300° C	400° C
Density kg/dm ³	7,7				
Modulus of elasticity GPa	215	212	205	200	190
Mean coeff. of thermal expansion 20°C – Temp. $\times 10^{-6} \cdot K^{-1}$	-	10,5	11,0	11,5	12,0
Thermal conductivity W/m · K	30				
Electrical resistivity $\Omega \cdot mm^2/m$	0,6				
Specific thermal capacity J/kg · K	460				

Scaling temperature in air approx. 825° C.

Mechanical properties

Values at room temperature - QT 700

Tensile strength Rm	N/mm ²	700 - 850
Proof strength Rp02	N/mm ²	min 500
Elongation	%	min 13
Impact energy Kv	J/cm ²	min 25
Hardness	HB	appr 220

EN 1.4021 is a hardenable stainless steel containing 13% chrome. In the quenched and tempered condition it shows:

- ⇒ high tensile strength
- ⇒ good corrosion resistance
- ⇒ magnetism

Corrosion Resistance

EN 1.4021 has a good resistance to e.g. air, water steam, freshwater, certain alkaline solutions and other mildly aggressive chemicals.

Typical application areas

- Shafting
- Spindles
- Pump parts
- Valve parts
- Piston rods
- Fittings
- Stirrers
- Bolts
- Nuts

Heat treatment

Hardening

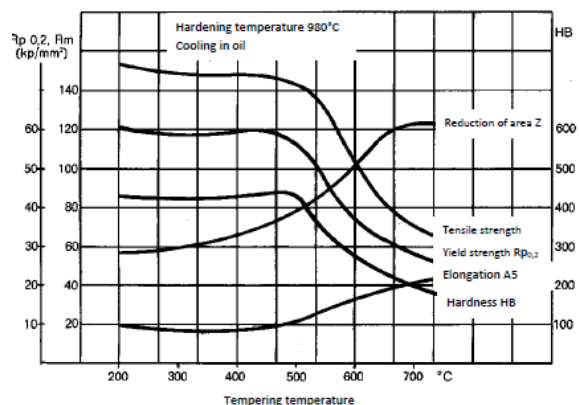
1020 - 980° C. Holding time at hardening temperature approx. 30 min. And then subsequent cooling in oil.

Tempering

The temperature is chosen according to the below graph to reach required strength. Holding time 2 hours. Cooling in air.

(N.B. The graph represents a specific heat and should only be seen as a guideline.)

QT 700 ~ 650-740° C



Fabrication

Hot forming

Hot forming should be carried out in the temperature range 1100-800°C. It is important that the entire workpiece has been exposed to a sufficiently high temperature. Slow cooling after hot forming. A full heat treatment i.e. quenching and tempering is recommended after hot forming.

Machining

Martensitic stainless steels such as EN 1.4021 are generally easier to machine than "conventional" austenitic steels and high alloy austenitic steels. Machinability is of course depending of heat treatment condition, if material is annealed or hardened and tempered.

Welding

Alt 1.

- a) To arrive at an optimal welding result the steel should be austenitized at 980° C during approx. 10 minutes.
- b) Then cool to approx. 400 - 300° C.
- c) Start welding at that temperature.
- d) After welding cool to 60 - 80°C.
- e) Then temper according to the graph shown under - " Heat treatment".

Alt 2.

If heating to 980° C under circumstances is impossible welding should be performed as follows:

- a) Start welding at 400 - 300° C.
- b) Then cool to 60 - 80° C.
- c) Temper at temperature approx. 10° C **below** the one at which the material has been tempered previously.

Welding consumables should in both alternatives above be similar to that of the parent one. If the material strength is of subordinate importance or if preheating under circumstances is impossible welding should be performed using austenitic consumables. After cooling, temper in accordance with Alt.2 -c) above.

Surface finish

EN 1.4021 is available with peeled surface.

Stock standard

Please refer to products stock standard:
www.valbrunanordic.se

Technical support

VALBRUNA NORDIC AB will be helpful in giving further advice and recommendations concerning choice of materials, welding, heat treatment etc.

MATERIAL STANDARDS

SS-EN 10088-3	Stainless steels-Semi-finished products, bars, rods, sections for general purposes
ASTM A 276/ ASME SA-276	Stainless steel bars for general purposes